THE INFLUENCE OF PATIENT RACE, PATIENT GENDER, AND PROVIDER PAIN-RELATED ATTITUDES ON PAIN ASSESSMENT AND TREATMENT RECOMMENDATIONS FOR CHILDREN WITH PAIN

by

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To all of the humans and canines in my life that helped me get to where I am today.

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ABSTRACT

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Chronic pain is a common and costly health condition for children. Previous studies have documented racial and gender disparities in pain care for adults, with women and racial minorities receiving poorer pain assessment and treatment. Providers contribute to these disparities when their pain-related decision-making systematically varies across patient demographic groups. Little is known about racial and gender disparities in children with chronic pain, or the extent to which providers contribute to these disparities. In a sample of 129 medical students (henceforth referred to as 'providers'), Virtual Human (VH) methodology and a pain-related version of the Implicit Association Test (IAT) were used to assess the effects of patient race/gender and provider implicit racial/gender attitudes on providers' pain assessment and treatment decisions for children with chronic pain. Findings indicated that, in the context of abdominal pain, providers rated Black patients as more distressed (mean difference [MD]=2.33, $p<.01$, SE=.71, 95% CI=.92, 3.73) and as experiencing more pain-related interference in daily activities (MD=3.14, $p<.01$, SE=.76, 95% CI=1.63, 4.64) compared to White patients. Providers were also more likely to recommended opioids for Black patients' pain compared to White patients (MD=2.41, $p<.01$, SE=.58, 95% CI=1.05, 3.76). Female patients were also perceived to be more distressed by their pain (MD=2.14, $p<.01$, SE=.79, 95% CI=.58, 3.70), however they there were no differences in treatment recommendations based on patient gender (all ps>.05). The sample reported implicit attitudes that men and Black Americans were more pain-tolerant

than their demographic counterparts; however, pain assessment and treatment decisions were not related to these implicit attitudes. This study represents a critical step in research on pain-related disparities in pediatric pain. Future studies are needed to further elucidate specific paths through which the pain experience and consequent treatment differ across racial and gender groups.

INTRODUCTION

Chronic pain, defined as pain occurring for more than 3 months, is a common and costly health condition for children. One in four children experience chronic pain due to various diseases, disorders, or accidents [40,42,48]. Pain diagnoses are associated with negative psychological (e.g., depression), physical (e.g., disability), and social (e.g., missed school and ostracism) outcomes among children [19,40,46]. The financial consequences of chronic pain in children are also considerable, estimated to be $19 billion annually in healthcare costs and lost productivity for caregivers [28]. Given these costs, proper pain assessment and treatment is paramount.

Previous studies have documented racial and gender disparities in pain care for adults, with racial minorities and women receiving poorer pain assessment and treatment [4,50,72]. Suboptimal pain care can negatively impact patient functioning, particularly for racial minorities and females who already face numerous medical and psychosocial barriers to maintaining a high quality of life [5,14,60,63,64,74,74]. Unrelieved chronic pain is associated with decreased cognitive functioning [42] and quality of life [40,41,42], as well as increased rates of depressive [19,42,46] and anxiety symptoms [53,71] in both adults and children. Inadequately treated pain also interferes with sleep [42,52] and is linked to higher work/school absenteeism [18,40,42,47], greater disability[19,42], and increased medical expenses [40,42] for adults and children.

Numerous biological, psychological, and social factors contribute to disparities in pain care. Healthcare providers represent one such factor. Providers contribute to these disparities when their pain-related decision-making systematically varies across patient demographic groups. Indeed, previous studies in adults have identified that providers' pain assessment and treatment decisions are often inappropriately influenced by patient race and gender [4,33,72]. Of note, several studies found empathy to play both direct and moderating roles in these relationships [9,15,45]. These findings have spurred the development of provider-focused interventions aimed at reducing these systematic differences by the promotion of empathy through perspective-taking exercises [15,81, Hirsh, R01MD008931].

In contrast to the literature in adults, much less is known about pain care disparities in children. Several studies have identified that racial disparities exist in pediatric health care in antibiotic prescribing [21], use of advanced imaging for diagnosis of abdominal pain [39], and referral to specialists [17,82]. Of the studies that have examined racial disparities in the context of pediatric pain care, the majority have focused on acute pain (e.g., long bone fractures, appendicitis pain, and emergency care) [22,27,44,57,61,65,84] with mixed results. Groenewald and colleagues (2018) examined racial disparities in opioid prescriptions for outpatient pain visits, a context more likely to include treatment of chronic pain, finding that minority children were less likely to have their pain treated with opioids than their White counterparts [29]. There are three important limitations that constrain the conclusions that may be drawn from these studies. Foremost, the management of acute and chronic pain differs in ways that are relevant to disparities. Acute pain is typically unambiguous and accompanied by objective evidence, whereas chronic pain is typically less straightforward. This is important because ambiguous situations are ripe for biased decision-making [8,34]. Specifically, ambiguous (i.e., less straightforward) situations increase cognitive load, which, in turn, leads to greater discriminatory behavior against vulnerable groups such as racial minorities and women [5,7,74]. Secondly, these studies did not assess provider attitudes (implicit or explicit). This is an important omission given previous studies highlighting the powerful impact of attitudes on subsequent judgments and decision making, in general [26,79] and specifically regarding healthcare [23,30,31,34,68]. Two types of attitudes are relevant in this context. Explicit attitudes are consciously held attitudes about an object, group, or self, whereas implicit attitudes occur without conscious awareness. In contemporary Western cultures, which have experienced a significant decline in explicitly held sexist and racist attitudes over the past 50 years [69,70,76], implicit attitudes about social groups are better predictors of discriminatory behavior [62] — this is strong rationale for examining the extent to which providers' implicit attitudes contribute to pain treatment disparities in children. Thirdly, these studies used retrospective or text-based vignette methods, which have limited experimental control and ecological validity, respectively. To address the aforementioned limitations and make an important contribution to our understanding of pain-related disparities in children, the Implicit Association Test (IAT) and Virtual Human (VH) methodology – combining high-fidelity computer-simulated patients with text-based "medical record" information – were used to examine racial and gender disparities in pediatric chronic pain care.

Current Study

Aim 1. Examine the effects of patient race and gender on medical students' (i.e., providers') pain assessment and treatment decisions for children with chronic pain.

Hypothesis 1a: Participants will provide lower pain assessment ratings and be less likely to use guideline-concordant pain treatments for Black patients than for White patients.

Hypothesis 1b: Participants will provide lower pain assessment ratings and be less likely to use guideline-concordant pain treatments for female patients than for male patients.

Aim 2. Examine the extent to which providers' implicit racial and gender attitudes moderate the relationship between patient race, patient gender, and providers' pain management decisions (Figure 1).

<u>Hypothesis 2a:</u> Participants with stronger implicit attitudes that Black individuals are pain-tolerant (and White individuals are pain-sensitive) will demonstrate greater racial disparities in their pain assessment/treatment decisions than participants with weaker pain-related implicit attitudes.

<u>Hypothesis 2b:</u> Participants with stronger implicit attitudes that women are pain-sensitive (and men are pain-tolerant) will demonstrate greater gender disparities in their pain assessment/treatment decisions than participants with weaker pain-related implicit attitudes.

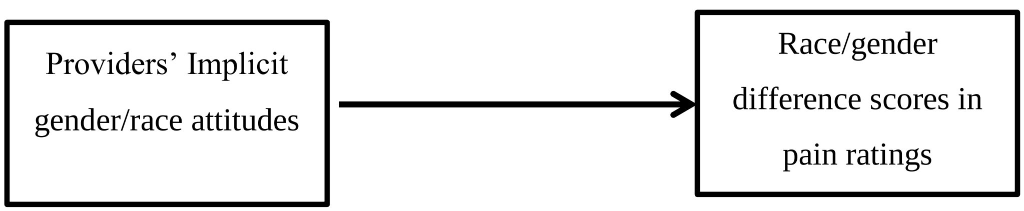

Figure 1. Provider implicit attitudes as moderator (simple moderation).

Aim 3. Explore the extent to which provider empathy augments the relationships examined in aim 2 (Figure 2).

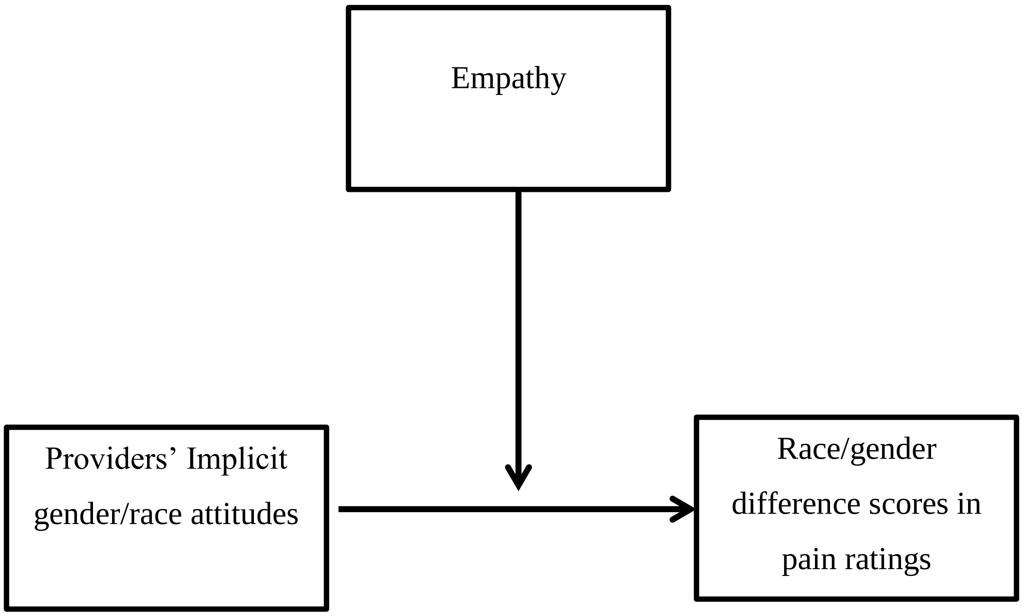

Figure 2. Provider empathy as moderator (moderated moderation).

METHODS

Participants

Medical students from U.S. medical training programs were recruited through email announcements to participate in the study. Medical students were chosen because they engage in patient care, including pediatrics; receive training in pain management; and are more easily accessible than practicing physicians. Participants needed to be at least 18 years of age, enrolled as a medical student in an accredited medical school, and have not previously participated in a study using virtual human technology to investigate decision-making for pain.

Stimuli

Participants were presented with full-motion videos of 4 computer-simulated pediatric patients. A still-frame image of one patient is presented in Figure 1 — this image is for illustrative purposes and does not convey the richness of the full-motion videos used in the actual study. All patients presented with chronic abdominal pain, which is common among children presenting to primary care [2]. Patients varied by race (White or Black) and gender (Male or Female) but otherwise exhibited similar pain behaviors (i.e., holding stomach, furrowing eyebrows, squeezing eyes shut). Each patient was accompanied by a fully animated race-matched maternal caregiver. Animations were similar across caregivers (i.e., turning to look at child). Each patient was accompanied by a text vignette (Figure 1), varying only in patient name, vitals, and wording used to describe relevant medical and psychosocial factors.

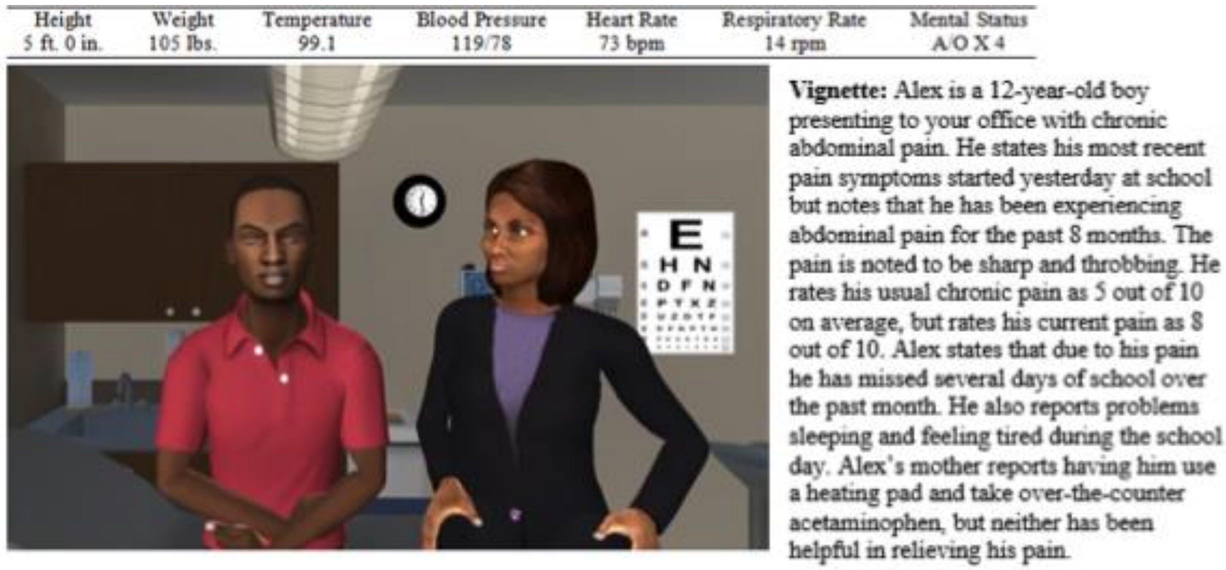

Figure 3. Still-image of Child Virtual Human Stimuli

Measures

Demographic and Clinical Experience Questionnaire

Participants self-reported demographic characteristics (i.e., race, gender, age) and clinical experiences (i.e., completion of a child-focused or pain-focused clinical rotation).

Pain Assessment and Treatment Recommendations

Participants made pain assessment (distress, pain-related interference, patient reaction to pain) and treatment decisions (opioid analgesic, non-opioid analgesic, referral to pain specialist, psychological therapy, referral to nutritionist, school accommodations) for 4 patients representing both races and genders using separate 100-point visual analog scales (VASs) similar to prior work [33,34]. For the assessment items, participants indicated the amount of distress/interference/overreaction they perceived the patients to be experiencing. For the treatment items, participants indicated their likelihood of using each treatment option for the patients.

Implicit Association Test

Participants' implicit attitudes were assessed using the IAT, which measures the strength of automatic associations between 2 target concepts and an attribute [24]. Participants completed two rounds of matching words or pictures into one of two categories; the categories switched after round one. Scores were calculated using the latencies in responding between the two rounds. Participants completed a race and gender version of the IAT. Both versions specifically pertained to pain sensitivity and tolerance – given prior work suggesting these pain-specific attitudes are more relevant to pain care decisions than are general implicit attitudes about race and gender [34] – and were pilot-tested for reliability and validity using established methods [24,25]. Using scores established by Greenwald and colleagues [25], IAT scores are interpreted as follows: no difference in pain-related attitudes between genders/races (absolute values 0 –.14), weak (absolute values .14 –.34), moderate (absolute values .35 –.64), or strong (absolute values .65 and above) association between the group [Black Americans (+)/White Americans (-) or Male (+)/Female (-)] and pain-tolerance.

Ambivalent Sexism Inventory

Participants' explicit gender attitudes were assessed using the Ambivalent Sexism Inventory (ASI) [20]. The ASI is a 22-item measure consisting of 2 subscales measuring hostile sexism (e.g., "Most women interpret innocent remarks or acts as being sexist") and benevolent sexism (e.g., "In a disaster, women ought to be rescued before men"). Items are rated on a

Likert-type scale ranging from 1 “strongly disagree” to 6 “strongly agree.” Subscale scores are computed by averaging responses from items on each subscale.

Complementary Stereotypes and Negative Prejudice

Participants’ explicit racial attitudes were assessed using the Complimentary Stereotypes and Negative Prejudice (CSNP) [12]. The CSNP consists of 2 subscales. The Complimentary Stereotypes (CS) scale assesses beliefs related to favorable stereotypes (e.g., athletic ability, social competence, and musical ability). The Negative Prejudice (NP) scale assesses hostile attitudes related to the idea of the inferiority of Black individuals and aversion to interracial contact. Participants endorse their level of agreement (1 “Strongly Disagree” to 7 “Strongly Agree”) with statements such as “A natural sense of rhythm makes rapping easy for Black people” (CS scale) and “I can’t understand why a White person would want to date a Black person” (NP scale). Total and subscale scores are calculated by averaging item responses.

Interpersonal Reactivity Index

The Interpersonal Reactivity Index [13] is a 28-item multidimensional measure of trait-level empathy consisting of four scales: 1) perspective taking, 2) empathic concern, 3) fantasy, and 4) personal distress. Perspective taking is characterized as the tendency to adopt the viewpoint of others (example item: “I sometimes try to understand my friends better by imagining how things look from their perspective”). Empathic concern is characterized as concern or sympathy for unfortunate others (example item: “I often have tender, concerned feelings for people less fortunate than me”). Fantasy is characterized as the tendency for a respondent to imaginatively transpose themselves into the feelings or actions of fictitious characters in media (example item: “I really get involved with the feelings of the characters in a novel”). Personal distress is characterized as self-oriented feelings of anxiety and unease in tense interpersonal settings (example item: “When I see someone who badly needs help in an emergency, I go to pieces”). Questions are answered on a five-point Likert-type scale ranging from 0 “Does not describe me well” to 4 “Describes me very well.” Items on each scale are summed for a scale score. The IRI is valid and reliable in medical student [10] and resident [38] samples.

Marlowe-Crowne Social Desirability Scale

Socially desirable responding was assessed using a shortened version [66] of the original Marlowe-Crowne Social Desirability Scale [10]. Participants responded to 13 forced-choice true/false items concerning everyday behavior. For example, “I’m always willing to admit it when I make a mistake.” Positive responses are item dependent as some items are reverse scored. Higher scores indicate a greater need to respond in a socially desirable manner.

Procedure

Participants completed the study online through the Qualtrics platform. In order to recruit a more geographically diverse sample, participants were recruited from medical programs across the U.S.. Participants provided demographic information, viewed computer-simulated pediatric patients presenting with chronic abdominal pain, completed two versions of the IAT, and completed a battery of questionnaires. To minimize order effects, pain decisions (assessment and treatment), the two versions of the IAT, and the questionnaire battery were counter-balanced across participants. In addition, within the pain decisions portion of the study, patient vignettes were presented in random order. During the questionnaire battery, participants completed measures assessing empathy (IRI [13]), sexist (ASI [20]) and racial attitudes (CSNP[12]), and social desirability (MCSDS [10]). The study took approximately 1 hour to complete, and participants were compensated with an electronic $30 Amazon.com gift card.

Analytic Plan

Data were evaluated for normality and assumptions of statistical tests. Descriptive statistics were computed to characterize the sample. Hypotheses 1a and 1b were tested with 2 (patient gender) x 2 (patient race) repeated measures ANOVAs on participants' pain assessment and treatment ratings. Both main and interaction effects were examined and interpreted as significant at $p < 0.05$. Post-hoc analyses were used to evaluate significant interaction effects using a Bonferroni adjustment to correct for multiple comparisons.

Due to the within-subjects design of this study, typical methods of assessing moderation [32] are not appropriate. For these designs, Judd and colleagues (2001) recommended using difference scores between the within-subjects variables, wherein the mean difference between the two instances of the within-subjects variable is regressed onto the between subjects variable. In the context of the current study, all pain assessment and treatment ratings are within-subjects variables. A difference score was calculated for each pain assessment/treatment rating by subtracting the average rating for Black patients from the average rating for White patients. Similarly, a difference score was calculated for each pain assessment/treatment rating by subtracting the average rating for male patients from the average rating for female patients. Then, the mean difference for each outcome for both race and gender was regressed onto participants' race/gender IAT scores. When IAT scores significantly ($p<.05$) predicted the mean difference in pain assessment and treatment ratings, moderation was supported.

Since moderation for Hypotheses 2a and 2b was examined using Judd and colleagues (2001) method, the role empathy (Aim 3, Figure 3) plays in the relationships tested in Aim 2 was explored using simple moderation via Hayes' regression based approach and the PROCESS macro [31]. Moderation was supported if the amount of variance accounted for in the relationship between IAT scores and assessment/treatment difference scores significantly increased ($p<.05$) when the interaction term (empathy X IAT score) is included in the model. Significant results were graphed for interpretation. All variables, with the exception of patient gender and race, were analyzed in continuous form.

Power Analysis

The target sample size of 129 participants was based on several criteria including effect size, power, and probability of making a Type I error. Studies in the adult chronic pain literature have found effect sizes ranging from Cohen's d equivalent of .09 to .93 for relationships similar to those examined in the current study [33,34,35,36]. Given the lack of relevant prior studies examining disparities in children with chronic pain, calculations were based on detecting a medium size effect (equivalent to a d=0.50) with 0.8 power and constraining the probability of making a Type I error to 5%. One hundred and twenty nine participants completed the study. Using G*Power, it was determined that with 129 participants and effect sizes (partial η_p^2) ranging from .01 to .09 for the significant primary analyses, the study was adequately powered (values ranging from .77 to 1.00).

RESULTS

One hundred and thirty-five participants (henceforth referred to as providers) were recruited. Six providers did not complete the entire study and were excluded from the analyses. The final sample consisted of 129 providers. Sample descriptives are summarized in Table 1. The sample was majority male (55.8%), White (64.3%), and not Hispanic or Latinx (94.6%). Average age of the sample was approximately 25 years (SD=2.3). A third of the sample completed the study within the first year of medical school.

Table 1. Sample Demographic Characteristics

N=129		M (SD) / n (%)
Age		25.0 (2.3)
Sex		
	Male	72 (55.8)
	Female	57 (44.2)
Race		
	White	83 (64.3)
	Black or African-American	12 (9.3)
	Asian	27 (2.9)
	Multi-racial	7 (5.4)
Ethnicity		
	Not Hispanic or Latinx	122 (94.6)
	Hispanic or Latinx	7 (5.4)
Years of Medical School Completed		
	Less than a year	41 (31.8)
	First Year	11 (8.5)
	Second Year	23 (17.8)
	Third Year	30 (23.3)
	Fourth Year	23 (17.8)
	Fifth Year	1 (.8)

Study variables were evaluated for normality. Primary analyses were run with and without outliers, as well as with and without log-transformed variables to evaluate any change in results indicated by the non-normal variables. Neither, elimination of outliers nor transformation of non-normal variables changed the outcome of the proposed analyses. Therefore, the full dataset was used for all proposed analyses.

Zero-order correlations between study variables are reported in Tables 2 & 3. As a whole, the sample demonstrated a slight implicit association between Black (vs. White) American and pain-tolerant (M=.19, SD=.29). Additionally, the sample demonstrated a moderate implicit association between men (vs. women) and pain-tolerant (M=.38, SD=.29). Average MCSDS rating was 6.28 (SD=2.88) with scores ranging from 0 to 12. To assess the influence of social desirability, predictor and outcome variables were correlated with MCSDS scores. MCSDS scores were significantly associated with empathic concern (r=.26, p<.05). However, MCSDS scores were not associated with provider pain-related implicit racial or gender attitudes or racial/gender differences in pain assessment and treatment decisions (all *ps*>.05). Mean ratings for pain assessment and treatment recommendations by race and gender category are reported in Table 4

Table 2. Zero-order Correlations Among Race Variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Sex	-	-	-																						
2. Age	24.96	2.26	.12	-																					
3. Race Pain IAT Score	0.19	0.29	.11	-.02	-																				
4.Complimentary Stereotypes (CSNP)	3.59	0.75	-.11	-.08	.12	-																			
5. Negative Prejudice (CSNP) Score	2.19	0.90	**-.18***	**-.24****	-.08	**.30****	-																		
6. Empathetic Concern (IRI) Score	19.22	3.07	**.18***	0.11	.16	-.01	**-.30****	-																	
7. Black Pt Distress	65.05	14.51	.16	.01	-.00	.03	-.12	.09	-																
8. White Pt Distress	62.70	15.16	.16	.04	-.06	-.02	-.10	.06	**.85****	-															
9. Black Pt Interference	66.75	15.55	.16	-.07	.00	-.03	-.17	.10	**.73****	**.67****	-														
10. White Pt Interference	63.76	15.94	.14	-.08	-.07	-.06	**-.18***	.01	**.71****	**.75****	**.85****	-													
11. Black Pt Reaction to Pain	46.63	14.39	.11	.13	.06	.14	.13	-.09	**-.34****	**-.30****	**-.33****	-.31**	-												
12. White Pt Reaction to Pain	46.89	15.12	.05	.15	.05	.08	.10	-.09	**-.27****	**-.25****	**-.28****	-.25**	.80**	-											
13.Black Pt Opioids	19.57	21.58	-.06	-.13	-.02	.03	-.03	.10	**.32****	**.28****	**.28****	.33**	-.29**	-.24**	-										
14. White Pt Opioids	17.02	21.03	-.08	-.14	.01	.03	-.03	.13	**.30****	**.28****	**.29****	.34**	-.28**	-.24**	.93**	-									
15. Black Pt Non-opioids	78.78	21.03	-.10	-.12	.09	.11	-.04	.03	.17	.08	.10	.05	.01	.00	.00	.02	-								
16. White Pt Non-opioids	78.26	21.19	-.05	**-.19***	.05	.10	-.05	.00	**.24****	**.19***	**.22***	.21*	.03	.01	.07	.08	.90**	-							
17. Black Pt Specialist	73.60	24.76	.05	-.17	-.05	**-.19***	-.16	-.04	**.21***	**.22***	**.35****	.36**	-.27**	-.29**	.02	.02	.16	.19*	-						
18. White Pt Specialist	71.86	25.73	.04	-.14	-.07	**-.23****	-.16	-.03	**.26****	**.30****	**.37****	.40**	-.28**	-.32**	.09	.07	.16	.23**	.92**	-					
19. Black Pt Psychological Therapy	37.62	26.61	**.21***	**.20***	.00	**-.21***	.02	.01	**-.18***	-.12	-.09	-.15	.25**	.19*	-.22*	-.24**	-.30**	-.26**	.01	.05	-				
20. White Pt Psychological Therapy	37.03	26.87	**.21***	**.21***	.00	**-.24****	-.08	.05	**-.19***	-.15	-.06	-.15	.25**	.18*	-.23**	-.23**	-.23**	-.20*	.04	.06	.93**	-			
21. Black Pt Nutritionist	47.98	28.53	.09	-.07	.00	-.15	-.07	.08	.10	0.08	.21*	.15	-.08	-.09	.11	.13	-.22*	-.16	.36**	.37**	.39**	.38**	-		
22. White Pt Nutritionist	47.66	28.99	.08	-.01	-.01	**-.19***	-.09	.13	.14	0.12	**.25****	.18*	-.10	-.12	.12	.16	-.19*	-.12	.29**	.33**	.38**	.37**	.95**	-	
23. Black Pt School Accommodations	53.25	24.64	.05	.14	.06	-.10	**-.23***	.08	.12	0.16	**.23****	.30**	-.21*	-.20*	.33**	.35**	-.08	-.05	.18*	.22*	.10	.09	.27**	.26**	-
24. White Pt School Accommodations	51.88	24.45	.07	.05	.02	-.09	-.17	.07	.15	**.23****	**.27****	.35**	-.20*	-.15	.34**	.36**	-.09	-.05	.19*	.25**	.13	.08	.29**	.28**	.92**

Abbreviations: CSNP - Complimentary Stereotypes Negative Prejudice; IRI - Interpersonal Reactivity Index; Pt - Patients

* *p*<.05, ** *p*<.01

Table 3. Zero-order Correlations Among Gender Variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Sex	-	-	-																					
2. Age	24.96	2.26	0.12	-																				
3. Gender Pain IAT Score	0.38	0.29	-0.18*	-.08	-																			
4. ASI Score	1.65	0.81	-.41**	-.29**	.23*	-																		
5. Empathetic Concern (IRI) Score	19.22	3.07	.18*	.11	-.18*	-.14	-																	
6. Female Pt Distress	64.95	14.12	.22*	.03	-.01	-.22*	.02	-																
7. Male Pt Distress	62.79	15.77	.11	.02	.02	-.16	.11	.83**	-															
8. Female Pt Interference	66.09	15.42	.18*	-.10	-.05	-.23**	.05	.78**	.67**	-														
9. Male Pt Interference	64.42	16.78	.12	-.05	-.03	-.23**	.06	.67**	.67**	.77**	-													
10. Female Pt Reaction to Pain	46.91	14.63	.09	.11	.08	.13	-.14	-.31**	-.23*	-.32**	-.22*	-												
11. Male Pt Reaction to Pain	46.61	15.22	.07	.17	.10	.07	-.05	-.33**	-.27**	-.32**	-.28**	.75**	-											
12.Female Pt Opioids	18.49	21.24	-.05	-.17	-.10	-.05	.13	.26**	.31**	.56**	.30**	-.26**	-.27**	-										
13. Male Pt Opioids	18.10	21.17	-.10	-.11	-.08	-.05	.10	.26**	.34**	.29**	.36**	-.24**	-.26**	.95**	-									
14. Female Pt Non-opioids	78.82	21.00	-.04	-.11	.10	.00	.02	.14	.23**	.16	.14	.01	.07	.03	.03	-								
15. Male Pt Non-opioids	78.22	21.36	-.11	-.19*	.04	.07	.01	.12	.19*	.10	.16	-.04	.01	.05	.05	.89**	-							
16. Female Pt Specialist	72.71	25.08	.09	-.17	-.09	-.32**	.02	.25**	.21*	.33**	.38**	-.28**	-.28**	.04	.03	.20*	.17*	-						
17. Male Pt Specialist	72.76	25.61	-.01	-.14	-.14	-.28**	-.05	.23**	.83**	.28**	.45**	-.29**	-30**	.06	.07	.18*	.19*	.91**	-					
18. Female Pt Psychological Therapy	36.78	26.85	.18*	.17*	-.18*	-.14	.02	-.14	-.15	-.11	-.06	.24**	.21*	-.21*	-.22*	-.22*	-.19*	.07	.08	-				
19. Male Pt Psychological Therapy	37.88	27.22	.23*	.23**	-.19*	-.18*	.04	-.17	-.17	-.12	-.15	.18*	.22*	-.24**	-.23**	-.26**	-.30**	-.01	.02	.89**	-			
20. Female Pt Nutritionist	48.47	29.16	.05	-.05	-.15	-.16	.09	.10	.10	.17	.20*	-.07	-.10	.12	.12	-.18*	-.18*	.33**	.30**	.37**	.35**	-		
21. Male Pt Nutritionist	47.17	28.36	.13	-.03	-.16	-.24**	.13	.12	.11	.18*	.22*	-.10	-.11	.15	.13	-.16	-.17*	.37**	.34**	.39**	.39**	.95**	-	
22. Female Pt School Accommodations	52.55	24.79	.06	.07	-.10	-.21*	.05	.17	.11	.30**	.28**	-.23**	-.16	.36**	.37**	-.05	-.07	.26**	.19*	.09	.07	.26**	.27**	
23. Male Pt School Accommodations	52.59	24.63	.07	.12	-.16	-.25**	.11	.20*	.18*	.29**	.24**	.02	-.15	.32**	.33**	-.05	-.09	.22*	.16	.11	.12	.27**	.29**	.90**

Abbreviations: ASI - Ambivalent Sexism Inventory; IRI - Interpersonal Reactivity Index
* p<.05, ** p<.01

Table 4. Mean Ratings Across Patient Race and Gender Categories

	Race Category	Female Patients		Male Patients	
		Mean	SD	Mean	SD
Distress					
	White	64.24	15.36	61.16	17.81
	Black	65.62	15.13	64.43	16.14
Interference					
	White	65.46	16.62	62.05	18.77
	Black	67.00	16.01	66.78	17.71
Reaction to Pain					
	White	46.14	16.61	47.64	17.31
	Black	47.45	14.91	45.58	16.74
Opioids					
	White	17.36	21.99	16.68	21.39
	Black	19.33	22.13	19.53	22.47
Non-opioids					
	White	78.46	23.16	78.05	22.80
	Black	79.16	21.94	78.38	22.14
Specialist					
	White	71.95	27.13	71.78	27.11
	Black	73.42	25.24	73.75	26.37
Psychological Therapy					
	White	36.13	27.84	37.93	28.84
	Black	36.78	27.09	37.83	27.26
Nutritionist					
	White	48.57	30.61	46.75	29.55
	Black	48.92	28.95	47.59	29.11
School Accommodations					
	White	51.18	26.15	52.59	25.87
	Black	54.27	25.43	52.59	25.38

Relationship of Patient Race and Patient Gender to Pain Assessment and Treatment

Pain Assessment

Statistical values for the RMANOVAs are reported in Table 5. A significant main effect of patient race on ratings of pain-related distress (Figure 4) indicated providers rated Black patients to be more distressed than White patients (mean difference [MD]=2.33, p<.01, SE=.71, 95% CI=.92, 3.73). A significant main effect of patient gender on rating of pain-related distress (Figure 4) indicated that providers rated female patients (MD=2.14, *p*<.01, SE=.79, 95% CI=.58, 3.70) as more distressed by their pain than male patients.

A significant main effect of patient race on ratings of pain-related interference (Figure 5) indicated providers rated the pain as more interfering for Black patients than White patients (MD=3.14, *p*<.01, SE=.76, 95% CI=1.63, 4.64). Pain-related interference ratings did not significantly differ between male and female patients.

Ratings of patients' reaction to pain did not significantly differ by patient race or gender. Interactions between patient race and gender were not supported for any of the pain assessment outcomes.

Treatment Recommendations

A significant main effect of patient race on recommendations to prescribe opioids (Figure 6) indicated that providers were more likely to recommend opioids for Black patients than White patients (MD=2.41, *p*<.01, SE=.58, 95% CI=1.05, 3.76).

A main effect of race on recommendations for non-opioid medication, referral to a pain specialist or gastroenterologist, psychological therapy, nutritionist, and school accommodations was not supported. Of note, a main effect of patient race on providers' recommendation for referral to a pain specialist or gastroenterologist trended towards significance (p=.051) indicating that providers were more likely to recommend pain specialist or gastroenterologist for Black patients than White patients (MD=1.73, *p*=.05, SE=.87, 95% CI=.004, 3.45).

Additionally, main effects of patient gender on recommendations for opioids, non-opioid medication, referral to a pain specialist or gastroenterologist, psychotherapy, nutritionist, and school accommodations were not found. None of the patient race X patient gender interactions reached significance.

Table 5. RMANOVAs of the Effect of Patient Race/Gender on Pain Assessment and Treatment Recommendations

Outcome	Predictor	*df*	*F*	*p*	partial η_p^2
Pain-related distress					
	Race	**1,128**	**10.78**	**< 0.01**	**0.08**
	Gender	**1,128**	**7.40**	**< 0.01**	**0.01**
	Race x Gender	1,128	1.46	0.23	0.01
Pain-related interference					
	Race	**1,128**	**17.01**	**< 0.01**	**0.12**
	Gender	1,128	3.48	0.06	0.03
	Race x Gender	1,128	3.76	0.06	0.03
Reaction to Pain					
	Race	1,128	0.20	0.66	0.00
	Gender	1,128	0.04	0.84	0.00
	Race x Gender	1,128	3.76	0.06	0.03
Opioids					
	Race	**1,128**	**12.33**	**< 0.01**	**0.09**
	Gender	1,128	0.17	0.68	0.00
	Race x Gender	1,128	0.33	0.57	0.00
Non-opioids					
	Race	1,128	0.40	0.53	0.00
	Gender	1,128	0.47	0.50	0.00
	Race x Gender	1,128	0.03	0.86	0.00
Specialist					
	Race	1,128	3.94	0.05	0.03
	Gender	1,128	0.01	0.93	0.00
	Race x Gender	1,128	0.07	0.80	0.00
Psychological Therapy					
	Race	1,128	0.10	0.76	0.00
	Gender	1,128	1.62	0.21	0.01
	Race x Gender	1,128	0.23	0.64	0.00
Nutritionist					
	Race	1,128	0.53	0.47	0.00
	Gender	1,128	3.76	0.06	0.03
	Race x Gender	1,128	0.07	0.79	0.00
School Accommodations					
	Race	1,128	3.37	0.07	0.03
	Gender	1,128	0.02	0.89	0.00
	Race x Gender	1,128	2.86	0.09	0.02

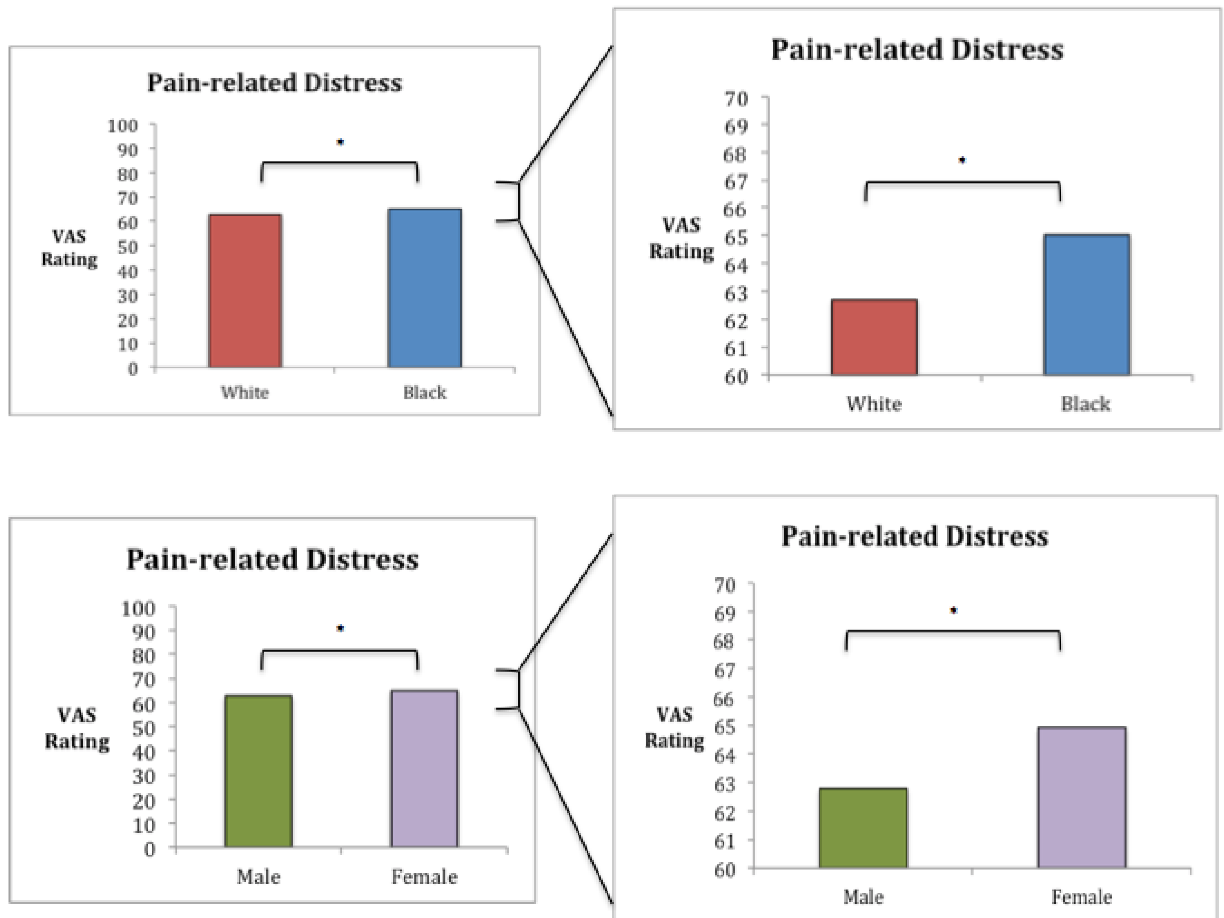

Figure 4. Main Effect of Race and Gender on Distress Ratings

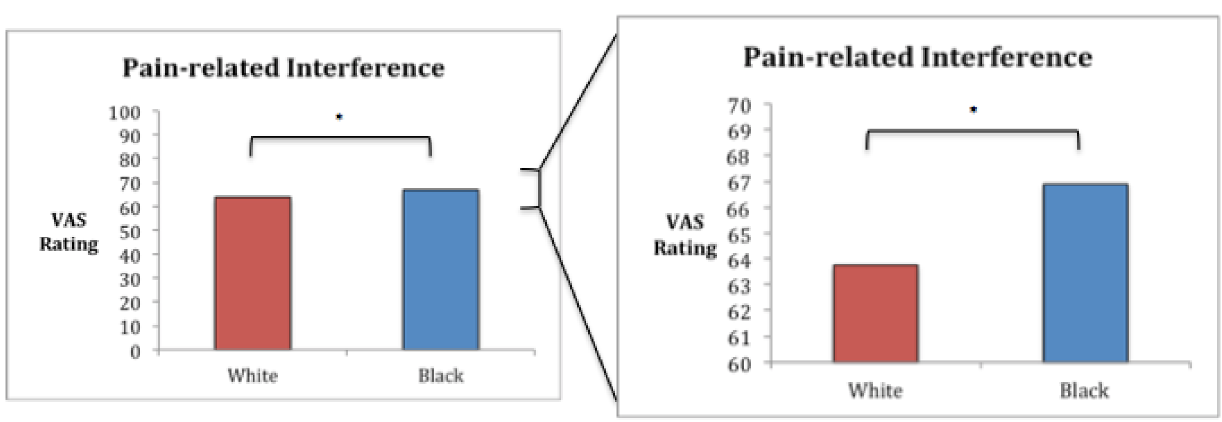

Figure 5. Main Effect of Race on Pain Interference Ratings

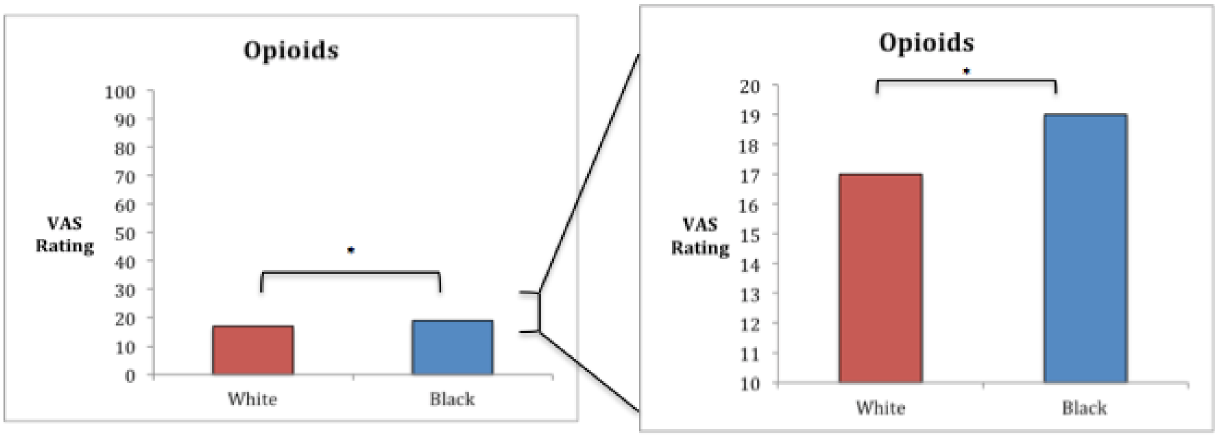

Figure 6. Main Effect of Race on Opioid Recommendations

Implicit Pain-related Attitudes as Moderator

Implicit pain-related racial attitudes did not predict race differences for any of the pain assessment or pain treatment outcomes (all *ps*>.05, Table 6), thus suggesting implicit pain-related racial attitudes do not moderate the relationships between patient race and pain assessment/treatment outcomes. Similarly, implicit pain-related gender attitudes did not predict gender differences for any of the pain assessment or pain treatment outcomes (all *ps*>.05, Table 6), thus suggesting implicit pain-related gender attitudes are not a moderator in the relationships between patient gender and pain assessment/treatment outcomes.

Empathy as Moderator

The interaction of empathic concern and implicit pain-related racial attitudes did not predict additional variability in race differences for any of the pain assessment or pain treatment outcomes (all *ps*>.05, Table 7), thus suggesting empathic concern does not moderate the relationships between implicit pain-related racial attitude scores and the pain assessment/treatment race difference scores. A similar pattern was found for gender-focused analyses (all *ps*>.05, Table 8).

Table 6. Regression Results Examining the Prediction of Race and Gender Differences in Pain Assessment/Treatment by Provider Implicit Pain-related Racial and Gender Attitudes

Outcome	F	R^2	B	β	SE	*p*
Gender Outcomes						
Distress DS	0.25	0.002	0.40	0.05	0.80	0.62
Pain interference DS	0.02	0.00	0.13	0.01	0.99	0.90
Reaction to Pain DS	0.17	0.04	0.39	0.04	0.94	0.68
Opioids DS	1.13	0.01	0.62	0.10	0.59	0.29
Non-opioid Medication DS	1.56	0.01	-1.08	-0.11	0.87	0.22
Specialist DS	1.75	0.01	-1.27	-0.12	0.96	0.19
Psychological Therapy DS	0.03	0.00	-0.18	-0.02	1.06	0.87
Nutritionist DS	0.33	0.003	-0.48	-0.05	0.83	0.57
School Accommodations DS	2.56	0.02	-1.56	-0.14	0.97	0.11
Race Outcomes						
Distress DS	1.37	0.01	0.84	0.10	0.72	0.24
Pain interference DS	2.17	0.02	1.14	0.13	0.77	0.14
Reaction to Pain DS	0.01	0.00	0.06	0.01	0.85	0.94
Opioids DS	1.09	0.01	-0.72	-0.09	0.69	0.30
Non-opioid Medication DS	1.00	0.01	0.82	0.09	0.82	0.32
Specialist DS	0.65	0.01	0.72	0.07	0.89	0.42
Psychological Therapy DS	0.02	0.00	-0.11	-0.01	0.88	0.90
Nutritionist DS	0.11	0.01	0.27	0.03	0.83	0.74
School Accommodations DS	1.88	0.02	1.18	0.12	0.86	0.17

Table 7. Moderation of Relationship between Implicit Pain-related Racial Attitudes and Race Differences in Pain Assessment/Treatment by Empathy

	Δ R^2 due to Interaction	F	df	*p*
<u>Dependent Variable</u>				
Pain Assessment				
Pain-related Distress DS	.00	.10	1,122	.76
Pain-related Interference DS	.00	.22	1,122	.64
Reaction to Pain DS	.00	.24	1,122	.62
Treatment Recommendations				
Opioids DS	.00	.56	1,122	.46
Non-opioids DS	.02	1.95	1,122	.16
Specialist DS	.00	.00	1,122	.96
Psychotherapy DS	.01	.96	1,122	.33
Nutritionist DS	.00	.16	1,122	.69
School Accommodations DS	.00	.02	1,122	.90

*p<0.05, **p<0.01
Note: Interaction term = Implicit pain-related racial attitudes X Empathy
Abbreviation: DS – difference score

Table 8. Moderation of Relationship between Implicit Pain-related Gender Attitudes and Gender Differences in Pain Assessment/Treatment by Empathy

	Δ R^2 due to Interaction	F	df	*p*
<u>Dependent Variable</u>				
Pain Assessment				
Pain-related Distress DS	.01	1.47	1,122	.23
Pain-related Interference DS	.00	.14	1,122	.71
Reaction to Pain DS	.00	.23	1,122	.63
Treatment Recommendations				
Opioids DS	.00	.39	1,122	.53
Non-opioids DS	.00	.01	1,122	.94
Specialist DS	.00	.15	1,122	.70
Psychotherapy DS	.00	.19	1,122	.67
Nutritionist DS	.02	2.51	1,122	.12
School Accommodations DS	.00	.07	1,122	.80

*p<0.05, **p<0.01
Note: Interaction term = Implicit pain-related gender attitudes X Empathy
Abbreviation: DS – difference score

Post-hoc Analyses: Distress Ratings as a Mediator

Recent research suggests providers' assessment of patients' pain (e.g., exaggeration) may mediate racial differences in treatment recommendations [Procento et al., 2018 IASP presentation]. Given the current sample rated Black patients as more distressed, as having more pain-related interference, and were more likely to recommended opioid medication for Black patients compared to their White counterparts, pain-related distress and interference were explored as mediators in the relationship between race and opioid recommendations. Analyses were conducted using MEMORE SPSS macro [56], which uses similar statistical methods (i.e., bootstrapping method) as PROCESS [32] but allows for within-subject variables. Neither race differences in pain-related distress or pain-related interference significantly mediated the relationship between race and opioid recommendations (all $p > .05$, 0 included in all 95% C.I.).

DISCUSSION

Results suggest that providers perceived Black and female patients to be experiencing more pain-related distress than White and male patients. Providers judged Black patients to be experiencing more pain-related interference in their daily activities, and were more likely to recommend opioids to treat Black patients' abdominal pain compared to White patients' pain. There were no significant gender x race interactions. Neither providers' implicit pain-related racial/gender attitudes nor providers' trait-level empathy moderated the relationship between patient race/gender and providers' pain assessment and treatment recommendations.

Black patients were perceived to be more distressed, have more pain-related interference, and were more likely to be recommended opioids for treatment of their pain compared to White patients. Several studies in the adult pain disparities literature have found similar findings with Black patients' pain being rated as more unpleasant and more likely to warrant opioids than White patients [33]. However, studies focused on race differences in pediatric pain have found Black patients are less likely or as likely to receive opioids as White patients [22,61,65]. Of note, there are several important differences between the current study and past clinical studies. First, the current study examined race differences in pain assessment and treatment decisions in the context of chronic, as opposed to acute, pain. While the original postulation was the ambiguous nature of chronic abdominal pain would increase the likelihood of biased decision-making, the vignette description of the chronic nature of the pain may have had the opposite effect, giving providers evidence that the pain was recurrent and interfering with the child's life, and therefore more legitimate than a patient presenting to the ER with acute pain complaints. Relatedly, the presence of a maternal caregiver who was engaged and attending to the child's pain behaviors may have provided legitimacy to the child's pain complaints. The presence of a caregiver is not accounted for in clinical studies using ER data [22,61,65,84] or may not have been signaled in studies using only a pen-and-paper vignette format [27,68]. Another important difference between past studies and the current study is variation in age. Previous studies included wide age ranges (e.g., 9-11 years [27], 0-18 years [84], 0-21 years [22]) whereas the virtual patients in the current study were all 12 years old. It is unclear when stereotypical beliefs about a group, in this case racial group, become salient in a perceiver's mind. Previous literature has detailed stereotypical beliefs about Black Americans including they are aggressive [51,59,73], underachieving [59], and tough [51]. More specifically, young Black male adults are presumed to be "thugs" and "criminals" [73]. A 12-year-old patient, compared to a 16-year-old patient of the same racial group, may trigger weaker or different stereotypical assumptions in the provider's mind, which may differentially impact treatment decisions.

Similar to Black patients, female patients were rated as more distressed than male patients in the current study. However unlike Black patients, female patients were not given differential treatment recommendations despite providers' perception of increased distress. This finding echoes the adult pain literature that suggests women are at risk for having their pain discounted or misattributed to psychological causes [37,42]. The overall sample demonstrated a moderate implicit attitude that men are more pain-tolerant and women are more pain-sensitive. Although pain sensitivity and distress are not synonymous, taken together, these findings suggest that stereotypical beliefs by providers about women's increased sensitivity to pain [67,80,83] and emotional reaction to pain are salient for female patients of a relatively young age. Another driving factor for this perception could be the difference in pain socialization between girls and boys. Girls in pain receive more comfort from others, which may be driven, in part, by girls displaying more pain behaviors than boys [18]. However, this difference in socialization may be detrimental to girls. When a girl and boy present with equivalent pain behaviors, such as the patients in this study, the assumption may be that the girl is in less pain than the boy and instead is merely more distressed by the pain.

Providers demonstrated implicit attitudes that men and Black Americans are more pain-tolerant than their female and White American counterparts. However, implicit racial and gender pain-related attitudes were not consistently associated with pain assessment or treatment decisions and did not moderate the relationship between patient race/gender and pain assessment or treatment decisions. Previous studies have found people hold explicit race- and gender-stereotyped beliefs about pain tolerance [67,80,83]. This is the first study to demonstrate people hold similar implicit race- and gender-stereotyped pain attitudes. There are mixed findings on whether explicit pain-related beliefs influence a person's own pain tolerance. Gender-stereotyped pain beliefs were found to explain sex differences in pain tolerance during an experimental task [80]. Similar findings have not been reported for race-stereotyped pain beliefs, although this is an area of ongoing study [55]. Taken together with the current results, explicit and implicit race- and gender-stereotyped beliefs may influence one's own pain experience but may not translate into an individual's perception of pain in others. However, this hypothesis requires further focused investigation given the infancy of the literature and the variation in age of patients across studies.

The only previous study to examine implicit attitudes and clinical decision making for pediatric patients used the general Race IAT (matching of words/Black and White faces to categories of "good" vs. "bad"/Black Americans vs. White Americans) and found that providers with high implicit pro-White bias were less likely to recommend opioids for African American patients compared to providers with low implicit pro-White bias [68]. The current study is the first to use an IAT to specifically assess implicit pain-related gender and racial attitudes. While the pain-specific nature of this IAT was hypothesized to be more closely tied to disparities in pain assessment and treatment decisions [35], that hypothesis is not supported in the current data. However, what remains to be determined is the salience of stereotypes and implicit beliefs across the developmental continuum of the stereotyped group. For example, does a 12-year-old Black girl activate the same set of implicit racial and gender attitudes as a 16-year-old Black girl or as a 30-year-old Black woman?

Counter to existing literature, empathy did not play a role in the relationships among implicit attitudes, patient gender/race, and providers' pain assessment and treatment recommendations. In previous studies, more empathic providers made higher pain ratings and rated patients' symptoms as more valid [9,15,45]. Interventions to increase empathy through perspective taking have been successful in decreasing racial disparities in providers' treatment recommendations [15,81]. However, one factor that varies across studies is the measurement of empathy at the trait vs. state level. Drwecki and colleagues (2011) assessed participants' state-level of empathy for each patient and found empathy bias (endorsing higher levels of empathy for White versus Black patients) was associated with pain treatment bias (more pain treatment for White versus Black patients). Following a perspective taking exercise to foster empathy, Drwecki and colleagues (2011) found pain treatment bias decreased. In the current study, providers' trait empathy was measured and was not found to be related to biased pain treatment decision making. State empathy, and the ability to influence it through perspective taking interventions at the individual patient level may play a more important role in moderating the relationship between implicit attitudes, patient gender/race, and providers' pain assessment and treatment recommendations.

To my knowledge, this is the first study to use experimental methodology, via computer-simulated pediatric patients, to investigate racial and gender disparities in the context of pediatric chronic pain. Previous experimental studies, which used a combination of written vignettes [27] and still images of children of varying ages [68], focused on a nurse or medical student's decision making surrounding an acute pain episode. The current study improved on this methodology by incorporating videos which enabled patients to present with dynamic pain behaviors. Pain behaviors communicate important information about a person's pain to those in the social environment, enhancing the realism of the "clinical encounter." Additionally, this study controlled for both the presence and the involvement (e.g., emotional reaction to child's pain, information provided, and opinions on what treatment is best) of the caregiver, which vary across clinical encounters, as well as across the gender, race, and age of the child [53]. By using virtual patients, the effect of variations in child race and gender on providers' pain assessment and treatment decisions was isolated from other contextual factors, such as parent presence or involvement, which may influence the provider. In future studies, the systematic examination of the effect of child factors versus parent factors on providers' decision-making will help to clarify the most appropriate and effective targets for intervention.

Given the infancy of this area of research, many important research questions remain unanswered. Future research studies should investigate provider implicit racial and gender attitudes as they relate to pain assessment and treatment decisions across patient age and pain condition. The salience of racial or gender stereotypes and consequent strength of implicit attitudes may vary with patient age. Additionally, the characteristics of the pain diagnosis (e.g., ambiguity, legitimacy, availability of guideline-concordant treatment for its management) may influence providers' decision making across racial and gender groups. Another important question to consider is how parental factors may influence providers' decision making. For example, the way the parent reacts to the child's pain (worry vs. disinterest) or a parent's opinions on a suggested treatment and/or the best treatment would likely influence a provider's treatment recommendations [53] – these effects might differ for White vs. Black parents and mothers vs. fathers. A related subject would be investigating more subtle disparities in pain care, including differential patient engagement by providers. Previous research found physicians engage Black children less often by asking them fewer questions about their presenting illness than White children [75]. This differential engagement may result in differing levels of health agency in childhood and into adulthood which may have long-term consequences for patients with a chronic illness such as chronic pain. Assessing if providers have attentional biases (i.e., non-verbal cues and verbal cues) during a clinical encounter, and if this varies by patient race and gender, may provide a clearer picture of what information the provider uses from the interaction and therefore is most relevant and most likely to drive biased decision-making. Lastly, previous studies have shown that state empathy is malleable and reduces bias in pain treatment [15]. Therefore, state empathy should be examined in the relationship between implicit attitudes, patient gender/race, and providers' pain assessment and treatment recommendations, as it may provide a meaningful target for intervention.

There are several limitations to the current study. First, medical students have less experience treating chronic pain and/or pediatric patients than do licensed physicians, therefore results from this study may not generalize to licensed physicians. This may be particularly important given that providers report less empathy as they gain more clinical experience [58].

Secondly, participants assessed and recommended treatments for virtual patients on a computer, which is different from providing care in a clinical setting. Among other differences, providers were allowed an infinite amount of time for each patient which does not adequately reflect the time pressures of a clinical environment which has been shown to increase activation of implicit attitudes [7]. Thirdly, participants were unable to ask patients clarifying questions about their condition. Details gained from additional questioning could have influenced providers' pain assessment and treatment decisions.

Many pediatric pain conditions (e.g. sickle cell [1], fibromyalgia [3]) persist into adulthood. Therefore, patients who receive inequitable pain care as children may ultimately suffer a lifetime of negative physical, emotional, and social consequences. This study represents a critical step in research on pain-related disparities in pediatric pain. Future studies are needed to further elucidate specific paths through which the pain experience and consequent treatment differ across racial and gender groups. Identification of these differences can be leveraged to design targeted interventions to reduce inequalities in the pediatric pain experience.

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